US005152787A

United States Patent [19]

Hamblen

[11] Patent Number: 5,152,787

[45] Date of Patent: Oct. 6, 1992

[54] INTRAOCULAR GRADIENT-INDEX LENSES USED IN EYE IMPLANTATION

[75] Inventor: David P. Hamblen, Rochester, N.Y.

[73] Assignee: Eastman Kodak Company, Rochester, N.Y.

[21] Appl. No.: 629,893

[22] Filed: Dec. 19, 1990

[51] Int. Cl.[5] A61F 2/16

[52] U.S. Cl. ..... 623/6; 351/160 R; 351/161; 264/1.7; 264/2.1; 623/901

[58] Field of Search ..... 623/6, 901; 351/160 R, 351/161, 168

[56] References Cited

U.S. PATENT DOCUMENTS

Re. 33,039	8/1989	Arnott	623/6
4,022,855	5/1977	Hamblen	264/1
4,087,866	5/1978	Choyce et al.	623/6
4,441,217	4/1984	Cozean, Jr.	623/6
4,504,982	3/1985	Burk	623/6
4,513,456	4/1985	White	623/6
4,524,468	6/1985	Kelman	623/6
4,536,897	8/1985	Powell	623/6
4,615,701	10/1986	Woods	623/6
4,664,666	5/1987	Barrett	623/6
4,666,249	5/1987	Bauman et al.	351/160
4,666,640	5/1987	Neefe	264/2.1
4,769,033	9/1988	Nordan	623/6
4,813,955	3/1989	Achatz et al.	623/6

FOREIGN PATENT DOCUMENTS

0308705A2	9/1988	European Pat. Off. .	
0329981A1	1/1989	European Pat. Off. .	
WO86/03961	7/1986	PCT Int'l Appl.	623/6
WO87/07496	12/1987	PCT Int'l Appl.	623/6
2151371	7/1985	United Kingdom	623/6

OTHER PUBLICATIONS

"Dual Vision Lenses Give A Better View", by J. Hecht, *New Scientist*, 1990 623-626.

Primary Examiner—Ronald Frinks

Attorney, Agent, or Firm—Charles E. Snee, III.

[57] ABSTRACT

The present invention relates to implants (intraocular lenses) for implantation in the human eyeball to replace the natural crystalline lens. In general, the implant includes a body which includes anterior and posterior surfaces, an axis, and a periphery. The body is formed of a transparent material having an index of refraction which varies with a predetermined profile from the axis to the periphery of the body. In a first embodiment, the body is formed of one element having a convex-convex shape and an index of refraction which decreases in the direction away from the axis of the body. For dual-focus capabilities, the body has an inner and an outer zone with separate gradient profiles and surface curvatures, or an inner zone which is offset from the axis and is the center of the gradient profile. The inner and outer zones provide focusing for nearby and distant objects respectively. In a second embodiment, the implant includes an achromatic doublet lens of first and second contacting elements formed of a transparent material. The transparent materials of the first and second elements have gradient indices of refraction which decrease in opposite directions from each other between the axis to the periphery of the lens. Haptics extend from the periphery of each implant for engagement with appropriate portions of the eyeball.

4 Claims, 4 Drawing Sheets